REMARKS

I. Introduction

Claims 1-21 stand rejected. Claims 1-21 have been cancelled. New claims 22-37 have been added. The specification and drawing have been amended as suggested by the Examiner. The amendment is supported by the original disclosure and does not add new matter.

Please reconsider the present application in light of the amendment and the following remarks.

II. Objection to the Drawings

Figure 1 was objected to because rectangular boxes 1-7 allegedly should be labelled. While this requirement is not necessarily agreed with, Applicant submits a replacement drawing where the boxes have been labelled based on existing subject matter in the specification.

III. Specification

While the requirement is not necessarily agreed with, the description of the drawings section has been situated in the text of the specification in the position suggested by the examiner.

IV. Claim rejections

A new set of claims 22-37 is respectfully submitted. Claim 22 roughly corresponds to one embodiment of previously presented claim 1. Claim 30 roughly corresponds to a second embodiment of previously presented claim 1. Accordingly, the rejection of claim 1 is addressed more specifically in the discussion of these new claims

V. New claims 22-37

The examiner rejected to claim 1 as being allegedly anticipated by Bowker. The applicant respectfully disagrees. To improve clarity, certain features of the invention have been recited more particularly in new claim 22. Claim 22 is similar to original claim 1, but is more specifically directed to the two-dimensional expanded beam embodiment of the invention.

Applicant respectfully submits that newly presented independent claim 22 is neither anticipated nor rendered obvious by the cited Bowker reference. New independent claim 22 recites:

> A system for imaging the sea bottom from a submerged position, comprising:
>
> a source of pulsed light configured to emit **a two-dimensional beam** of pulsed light;
>
> an aiming/directing device configured to direct the beam of pulsed light towards the sea bottom;
>
> a solid-state detector having an internal two-dimensional array of individual photosensitive detectors configured to generate electric current signals representing **a two-dimensional video image from the two-dimensional beam of reflected pulsed light**;
>
> **an image intensifier tube** having active gating control of a photocathode bias voltage, the photocathode bias voltage configured to control the optical gain of the image intensifier tube and **to selectively intensify or block the beam of reflected pulsed light to avoid the entrance of backscattered light**, the control being based at least in part on a known time needed for the beam of pulsed light to travel to and from the sea bottom.

Claim 22 recites a **two-dimensional** beam of pulsed light and an a two-dimensional array of detectors. (Dependent claim 23 expressly recites the two dimensional beam expander that produces this two-dimensional beam from a laser source.) In contrast, the system generally described by Bowker uses a fan-shaped beam and a field limiting slit so that only a linear slice of light is received and detected, rather than a two-dimensional expanded beam. Bowker then couples this structure with a streak tube in order to combine the results of multiple linear scans.. Essentially, Bowker takes a sequence of one dimensional image slices to obtain a volume display. Images are only produced by successive scans of adjacent sections. More specifically, the system of Bowker employs a technique known as Optical Time-Domain Reflectometry (OTDR) which consists of obtaining information about the volume of water in slices or vertical sections (column 3, lines 8-12). Using this procedure, the information Bowker obtains from each pulse is in the form of a line (column 6, lines 8-24). As these lines cannot be directly displayed

on a TV camera or otherwise do not represent a two-dimensional image, Bowker must scan the volume of water (column 6, line 65 to column 7, line 4) in order to obtain a number of adjacent lines for constructing a two-dimensional image that can be displayed on a TV monitor.

This contrasts with Applicant's recited two-dimensional beam and two dimensional detector. Bowker generally describes a system for obtaining information about a whole volume of water, from the bottom to the surface, by scanning <u>linear</u> slices of such volume of water. Bowker neither teaches nor suggest using a two dimensional light source or a two dimensional detector. Accordingly, claim 22 does not read on Bowker's system.

Moreover, claim 22 also recites a **gated image intensifier** that **selectively intensifies or blocks the beam of reflected pulsed light to avoid the entrance of backscattered light**. While the Office Action references Bowker 1:36-47 as allegedly describing a gated image intensifier, Applicant respectfully submits that there is no teaching of the recited "an image intensifier tube having active gating control of a photocathode bias voltage, the photocathode bias voltage configured to control the optical gain of the image intensifier tube and to selectively intensify or **block the beam of reflected pulsed light to avoid the entrance of backscattered light**," in Bowker. Applicant's image intensifier selectively blocks or intensifies the light to eliminate backscatter and only thus Applicant's system is configured to try and detect only the light from the sea bottom. In contrast, as described in Bowker 2:64-3:14, Bowker uses a streak tube to collect **all of the light** received over a period of time from a pulse, **including the backscattered ligh**t. For this additional reason, claim 22 is not taught or suggested by Bowker.

Bowker also mentions in Bowker's background section, a system that receives two gated images to detect shadows and eliminate backscatter. Bowker 1:34-46. Bowker specifically denigrates this approach as being unsuitable for solving the three-dimensional imaging problem that Bowker is attempting to solve. Bowker 1:47-63. Moreover, these image intensifier based systems discussed in Bowker's background section do not selectively intensify or block the beam of reflected pulsed light to avoid the entrance of backscattered light. Rather, these systems obtain multiple images and attempt to mathematically correct for backscattered light that has already been received and detected. This approach is unsuitable for imaging the sea bottom, because there may be no shadow of the target sea bad – in contrast Bowker's approach is specifically seeking to detect shadows of an object floating above the sea bed. The image intensifier approach discussed in Bowker's background section may be more suitable for

imaging mines, submarines, and other objects above the sea bottom, but is not suitable for imaging the sea bottom.

Combining two different, incompatible systems mentioned in the Bowker reference does not anticipate Applicant's claim 22. Moreover, it is not apparent why or how one skilled in the art could have been inclined to combine two such different systems for obtaining a third system which, as recited in Applicant's claim 22, obtains information about the sea bottom by emitting a single expanded two-dimensional beam of light.

The Office Action also makes reference to the photocathode of Bowker (reference number 32 in Fig. 2) as allegedly being equivalent to the detector of claim 1 (and new claim 22).. However, Bowker's photodetector is part of a streak tube (reference number 34 in Fig. 2), as disclosed in Bowker 2:51-52 and 6:8-10. A streak tube receives information in a sequential manner, e.g., a sequence of one-dimensional scans. This sequential information must be interpreted, processed, translated into a luminance signal, and mixed with line, field and frame synchronisation in order to create a standard baseband video signal prior to its representation as a two-dimensional image on a TV screen.

In contrast the system of claim 22 emits a two-dimensional beam of light (not a linear slice as in Bowker), and the reflected two-dimensional beam of light is directly employed for generating a two-dimensional detected image using a solid-state detector. No scanning is necessary; all the information required for generating the two-dimensional image may be received at approximately the same instant, and image processing prior to passing the two-dimensional information to a solid-state TV camera may in some cases be entirely avoided (e.g., the solid-state TV camera detector may directly generate a video image, as recited in dependent claim 23.).

Additionally, as disclosed in column 2, line 64 to column 3, line 12 of Bowker, in order to collect and analyze the light reflected by the objects along the illumination path, Bowker's detector remains "open" for a rather long period of time, thus receiving information from the location and reflectivity (through time position and amplitude of peaks in the reflected signal respectively) of the objects placed along an illumination line within a significant range of distances to the system. In contrast, the system of claim 22, may provide information from objects (namely the sea bottom) located at a specific distance. All other information may be blocked by the image intensifier tube which selectively blocks backscattered light.

Claims 23-29 depend from claim 22 and therefore should be allowable for at least similar reasons.

New independent claim 30 is similar to previously presented claim 1, but focuses on a single point light source scanning embodiment. Claim 30 recites:

> 30. (New) A system for imaging the sea bottom from a submerged position, comprising:
>
> a source of pulsed light configured to emit a concentrated beam of pulsed light illuminating a single point;
>
> an aiming/directing device configured to perform a two-dimensional scan of a portion of the sea bottom with the concentrated beam of pulse light from a single location;
>
> a single photodetector configured to generate a sequence of current pulses of temporal characteristics similar to temporal characteristics of a reflected pulsed light generated by the two dimensional scan;
>
> an image intensifier tube having active gating control of a photocathode bias voltage, the photocathode bias voltage configured to control the optical gain of the image intensifier tube and to selectively intensify or block the beam of reflected pulsed light to avoid the entrance of backscattered light, the control being based at least in part on a known time needed for the beam of pulsed light to travel to and from the sea bottom.

While claim 30 does not include the two-dimensional beam or detector of claim 22, the arguments presented with respect to the image intensifier tube configured to selectively block the beam and avoid the entrance of backscatter light, that is recited in claim 22, apply with equal weight to claim 30.

Additionally, claim 30 recites "an aiming/directing device configured to perform a two-dimensional scan of a portion of the sea bottom with the concentrated beam of pulse light **from a single location**;" Thus, an entire two-dimensional scan is produces by successively scanning the field of view from a single point. This contrasts with the system of the cited Bowker reference that relies on the movement of an aircraft carrying the detector to scan successive slices of the ocean. The system of Bowker performs a scan slice-by-slice by taking advantage of the movement of the plane carrying the system, but not through the use of any aiming/directing device. This is derived, for example, from column 7, lines 1-3: "*the sensor system is moved*

normal to the longitudinal axis of the pulse beam 12 between each exposure to illuminate adjacent sections of the ocean".

Bowker also does not have the aiming device recited in Applicant's claim 30. The Office Action cites Bowker's reflector 78 and the mirror 80 of Fig. 5 and column 8, lines 21-34. However, these components are part of Bowker's laser and do not provide any aiming capabilities. Both components 78 and 80 are the laser cavity feedback mirrors required for laser oscillation in an intra-cavity frequency-doubled laser device. In particular, these components do not allow scanning a two-dimensional area from a single point by successively aiming the light source at different points. Thus, no reference to any aiming capability is described in column 8, lines 21-34.

Claims 31-37 depend from claim 30 and therefore should be allowable for at least the same reasons as claim 30.

CONCLUSION

In view of the foregoing remarks, it is respectfully submitted that all pending claims of the present application are now in condition for allowance. Prompt reconsideration and allowance of the present application are therefore earnestly solicited.

While no additional fee is believed to be due, the Office is hereby authorized to charge any additional fees, which may arise out of the filing of this paper, or credit any overpayments to the deposit account of **K&L Gates LLP,** Deposit Account No. **080570**.

Respectfully submitted,

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